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AUTHOR Weaver, W. Timothy
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ABSTRACT

Schools of education, reacting to the demands for more teachers in the 1960s, increased recruitment activities and in many cases lowered admission standards. The result has been a decade-long condition of severe teacher surplus, declining career mobility for teachers and faculty, and an eroding wage base for educators. These conditions have affected the schools' capacities to attract and develop the most academically talented people to enter the teaching profession. An examination of data on results of recognized scholastic aptitude tests reveals a general decline in the scores of all applicants for higher education. Schools of education are seriously challenged to devise a system that attracts the most academically gifted students into education during a period of employment-market stress. To meet this challenge, institutions must act to reduce the teacher job applicant pool, but not further reduce enrollments below a survival level. One solution to this dilemma is to shift focus from an exclusive emphasis on public school teaching. Colleges must prepare education majors with skills that enable them to find professionally rewarding positions in non-school as well as school settings. (JD)

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THE TRAGEDY OF THE COMMONS: THE EFFECTS OF SUPPLY AND DEMAND ON THE EDUCATION TALENT POOL

Keynote Address. Strand D: Talent Pool

American Association of Colleges
of Teacher Education
Detroit, February 19, 1981

W. Timothy Weaver
Boston University
School of Education

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On Identifying the Right Problem

A dean, department chairman, senior and junior faculty member were on one of those educational tours in West Africa. They mistakenly wandered across the border into Angola during the height of that country's sad civil war. They were captured, tried as spies and sentenced to die at dawn by the guillotine. The first to be brought forward, in appropriate academic order, was the junior faculty member. As sweat poured from his brow, his neck was placed on the block, the rope pulled, but miraculously the blade failed to fall. He was spared in the French tradition. Next came the senior faculty member. His neck was placed on the block and the rope pulled. Again, the blade remained fixed, and he too was spared. The department chairman was next and, miracle of miracles, the blade failed a third time to fall and he was spared. The three praised God.

Finally came the dean. The sun was up now above the horizon, offering a clearer view as the dean's neck was secured in the block. He, being the last to commit himself, had had the benefit of studying the situation from several angles, as deans often do. Just as the signal was about to be given to pull the rope, the dean twisted his neck, raised his finger, pointing to the blade, and in a clear and decanal voice said, "Hold it fellows. I think I can see what's causing that little problem up there."

The Problem

Garrett Hardin, writing in Science (162:1968) likened the earth's natural resources to a common pasture on which everyone grazes his livestock according to his own desires. The immutable logic of self-interest dictates that if an individual cow is placed in the pasture, the owner derives total benefit from the cow while all other users must share each additional cow's overgrazing. Since there is no control over how many animals each individual grazes, the common pasture is inevitably destroyed because each individual's benefits outweigh his costs and everyone overuses

the pasture. Thus, as a corollary to Adam Smith's dictum that the only reliable human motive is self-interest, Hardin concluded that when commonly held resources are exploited according to self-interest, the resources will be overexploited and destroyed by the same people who benefit from them.

Anthony Picardi and William Seifert (Technology Review, 78:1976) apply Hardin's logic to the tragedy of the Sahal in sub-Sahara Africa. Heavy rain fall was followed by drought, and then horror of horrors, Western veterinary medicine, cattle management and deep wells were introduced as cures, causing overgrazing and eventual destruction of the range, leading finally to desertification and widespread famine.

What does this have to do with schools of education, or teachers colleges? We are guilty of overgrazing our pasture!

In the halcyon days of growth and unlimited resources, schools of education expanded their output of new graduates at an exponential rate, increasing output from about 220,000 graduates in 1967 to 317,000 in 1971 (Figure 1).* This is our first systems lesson in understanding the serious effects of time delay. Students graduating in 1971 had entered colleges and universities in 1967, a year in which teachers were in short supply and following a period of several years in which jobs were plentiful and salaries of teachers were rising faster than the economy. Unfortunately, the increasing demand for new elementary and secondary teachers stopped abruptly in 1969 and began falling rapidly throughout the decade of the 1970's, due of course to simple facts of demography. In a classic case of overshoot, schools of education enjoyed their peak years of producing new teachers four years after the job market for new teachers had collapsed. The result was a sudden upsurge in the reserve pool of unemployed teachers, and an equally sudden eclipse of student interest in preparing for teacher careers (Figure 2). Following the bear market signal, supplies of new teachers began falling eventually, but not rapidly enough to reequilibrate the system. Why?

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* Figures in Attachment 1.

Self-interest enters the picture. Schools of education began to admit a larger proportion of applicants in order to avoid total chaos in programs and staffing, a perfectly normal system response characteristic of most academic institutions. Following classic market tradition, each school of education's self-interest was served by trying to maintain enrollments at some reasonable level, and by seeking to capture a greater market share. Only the suicidal would have voluntarily cut back or closed the doors. The net result has been a decade-long condition of severe teacher surpluses, declining career mobility for teachers and faculty, and an eroding relative wage base for professional educators. But my concern goes deeper than that, which is not to say these are not serious enough problems for those of us responsible for preparing a profession. My concern has been the effects of these conditions on our capacity to attract and develop the most academically talented people we can find to enter leadership roles in teaching, research and administration. I'll return to the market dynamics and its connection to the talent pool later. But first allow me to place the talent pool discussion in context. I will not attempt to define talent in a way that most of you will find satisfying.

The work I have been doing focuses on a very narrow definition of talent -- tested verbal and math aptitude -- and even that is a matter of enormous controversy. Whether talent as one might want to define it bears <u>any</u> relationship to test scores is itself a matter for serious debate. I will simply take the position that test scores have some connection. It would be absurd to take the position that we don't care whether those who will teach others the basics are themselves proficient in the skills they teach. I also wish to say that it is not with any great pleasure that I talk about test scores of people preparing to enter teaching. We all know as educators that human potential is beyond measuring with the relatively simplistic, psychometric tools we are forced to use, even though the quasi-scientific literature on such tools would fill a good-sized college library. I am also aware of the inherent Pygmalion dangers of unfairly labelling individuals or groups on the basis of test scores. I have never believed that test scores alone adequately predict the effective teacher. Other factors are overwhelmingly important. No one wants teachers, no matter

how high their test scores, if they are lacking in either desire to work with children, or the intrinsic human qualities of empathy, caring and interpersonal competence. Teaching is an art of communication, but as an art cannot be measured solely by the number of advanced words in one's vocabulary.

I take very seriously the responsibility to place this discussion in its proper context. Through mere chance I have been recognized as having something to say about these matters, although any one of you in this room today could be equally eloquent on the subject. But, since I've been invited here today, I will share with you my thoughts. Please keep in mind that I began my study with an interest in understanding how academic institutions respond to changing market conditions, not whether American teachers are competent, nor whether teacher competency is a factor in explaining the long-term erosion of SAT scores of college-bound seniors or any other indicator of the "declining quality" of education.

I think I have discovered that there are relationships between the response of academic institutions, particularly those responsible for preparing leaders in education, the extremely tumultuous, and unexpected, if not unpredictable, changes in the job market demand for educators in this past decade, and the scholastic aptitude of our students. I believe that, left unexamined, the current responses of colleges, shall I call them cumulatively made decisions of preparing institutions, will produce long-term and serious problems for the continuing identification and development of academic talent in this field and for working conditions in general. My concerns are shared by Professor Nathan Keyfetz of Harvard and others who are examining separately the problems of human resource development in the arts, humanities and social sciences at a time when rewards in these fields are also at a low ebb.

That talent pool, from which future leaders in education will be drawn, enters the field through classroom teaching. If David Clark's findings are correct, the vast majority of professors of education began their initial careers as classroom teachers. Certainly that is true of principals, superintendents, supervisors and directors at the school system level. Since most deans of education are also professors of education, it is undoubtedly

true that most were also former teachers. In this sense, the development of talent in this profession can be likened to a closed plumbing system. What goes into the well determines what comes out of the spigot. Thus, there are very long range implications of these problems.

With this background in mind, let me turn to a description of the academic talent problem, as I understand it, and finally to solutions.

Teacher Test Scores

Has the talent pool for education changed? More precisely, are we selecting students now from a population with lower scholastic aptitude than was the case ten years ago? First, what is the evidence? I've looked at several kinds of test score data, from Education Testing Service, The College Board, American College Testing Program and National Longitudinal Study. In some instances I've requested and paid for special processing. For the most part, these data are available in annual reports and other documents. I've also requested and received from 19 colleges and universities, primarily in the Northeast, admissions, applications and test score data. These data are not publicly available and I have agreed not to reveal the identities of these institutions.

The following data have been examined:

(1) SAT verbal and math scores (means and standard educations) for college-bound high school seniors by intended field of study (Table 1).* Keep in mind that not all SAT takers go to college, although the vast majority do, and among those who are admitted and registered, intentions to major in a particular field change -- with some predictability -- over four years. These data are reported annually by the College Board for the years 1972-1980, and by various reports of the Wirtz Commission (On Further Examination).

(2) ACT English and math scores (means and standard deviations) for college-bound seniors by selected fields of study, 1970-1976 (Table 9). These data were provided by special processing and are not generally

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* All tables in Attachment 2.

available. The same caution, as cited above regarding SAT scores applies here: not all ACT test takers go to college, and student intentions to major in particular fields change.

(3) ACT English and math scores (means and standard deviations) for enrolled college freshmen by selected field of study (identified through the ACT descriptive questionnaire) for 1970, 1975 and 1978 (Tables 10 and 11).

(4) ACT English and math scores (means and standard deviations) and SAT verbal and math scores (means and standard deviations) of graduating college seniors in 1976 by general field of study (Tables 2 and 3). These data were obtained from the National Longitudinal Study, U.S. Department of Education, for the senior class of 1976.*

(5) SAT verbal and math scores (means and standard deviations) of 1976 college graduates majoring in teacher education who did or did not obtain teaching jobs in the first NLS follow-up (1976-77) (Table 4).

(6) NLS test battery scores (vocabulary, mathematics, reading comprehension and test composite means and standard deviations) for graduating college seniors by field of study, 1976 (Tables 5, 6, 7 and 8).

(7) GRE (Graduate Record of Evaluation) quantitative and verbal scores (means and standard deviations) by selected fields of study for test takers 1970-1975 (Table 12). Data were provided by Education Testing Service.

(8) NTE (National Teacher Examination) test scores (means and standard deviations) for test takers 1970-1975 (Table 13). Data were provided by Education Testing Service.

In reviewing these scores I observe the following:

(1) The earliest available ACT scores by field of study for college-bound high school seniors (1969-70) suggest that those students selecting

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* Note that data on ACT and SAT scores for college seniors by field show a large number of missing cases which may distort the results. The NLS test score data (see below) by field of study are more complete and probably provide a more accurate comparative base. The percentile rank of education majors on the NLS test battery are slightly higher than on SAT tests, perhaps reflecting the degree of distortion due to missing cases for the SAT scores.

elementary teaching majors fall roughtly around the population mean in English, slightly below in math (Figures 8 and 9). By 1976, scores for those intending to major in elementary education fall below the population mean on English and math. Math scores fall faster than English scores (about 18% from 1969 to 1975). The findings for enrolled Freshmen 1970-1975 show roughly the same pattern. Potential elementary education majors were closer to the population mean in 1970, and drop slightly in English, and a bit more in math by 1978. Secondary majors fall roughly around the population mean, or slightly above in English and remain there from 1970 to 1975. Math scores also tend to cluster around the mean but drop slightly below in 1975.

(2) The SAT scores for college-bound seniors by intended field of study are not available until 1972-73. At that time, those intending to major in all education fields combined fall below the population mean on average for both verbal and math scores. Relative positions show little change in verbal scores (Figure 4) by 1980, but some continued erosion of position in math is observable (Figure 3).

Has there been a change in scholastic aptitude in the initial applicant pool, i.e., graduating high school seniors who intend to select education as a college major? The answer is yes and no. Test scores of prospective teachers have definitely been declining. Consider where the average 1980 college-bound seniors selecting education as a major would rank on the SAT among all college-bound seniors, if they had been entering college in 1972. They would have ranked just above the bottom quartile in both verbal and math scores. But since SAT scores of all students have been declining, on average, the relative rank of those selecting education hasn't changed dramatically. Their verbal scores place them on average at about the 37th percentile in 1972 and in 1980. Their math scores place them, on average, at about the 37th percentile in 1972 and at about the 34th percentile in 1980. These changes in relative position are slight and possibly due to sample fluctuations.

As a point of reference consider that SATV and SATM scores of prospective businessmen and women (i.e., college-bound high school seniors) have fallen 10 and 17 points, while potential teachers' scores have fallen

29 and 31 points. In 1972 Education SATV scores were higher than business; now they are lower. But what about the fact that college students switch majors? Not everyone intending to major in education actually follows through on that intention. Even amont those who do, there is a sorting out process before graduation from college. In order to answer this question I have used the National Longitudinal Study data. 1976 is the only year for which test scores of graduating college seniors are available by field of study. Bear in mind that the actual test scores were collected by the National Longitudinal Study for the sample of 1976 college graduates prior to their entering college. The average SAT scores of college seniors majoring in all education fields combined placed them in the bottom one-third of the 1976 graduating class (but there is a potential problem of missing cases in the SAT data). Other scores on the NLS test battery place the average education major at roughly the 40th percentile, as do the ACT English and math scores.

The unavoidable conclusion is that the majority of new teacher graduates in 1976 fell into the lower half of their college class on skills measured by the SAT, ACT and NLS test battery.

While the arts and sciences fields show increases between scores of college-bound seniors and scores of students intending to enter those fields four years earlier, the education scores do not. Apparently, whatever sorting there is in education based on scholastic aptitude, the process does not result in graduates with higher test scores than the potential applicant pool four years earlier. This observation is consistent with Rex Jackson's work at ETS for the Wirtz Commission. The transfer pattern tends to be from the arts and sciences to the professions, and not the reverse. In the process, students graduating with arts and sciences degrees tend to have even higher test scores, relative to all graduates, while education majors tend to have lower test scores relative to all graduates.

(3) The GRE scores for education majors show declines relative to the population mean from 1970 to 1975 -- the latest date for which I have data. NTE scores show roughly the same pattern.

The overall pattern, at least as represented by these indicators, suggests an erosion in the talent pool of verbal and quantitative skills, even though relative rank has not changed much.

As an aside, but an important aside, it has been suggested that the mean verbal and math test scores of students majoring in the professions, and particularly in education, might have been negatively affected by an influx of minority students. The assumption is that the professions, particularly education, tend to be open to and attract larger proportions of non-white students than the arts and sciences. My examination of the NLS data supports neither contention: There is not a larger proportion of non-white students in education than in other career fields, and the presence of minorities among graduating education seniors has virtually no effect on SAT scores.

Do These Indicators Represent a Problem?

The decline in scholastic aptitude of prospective teachers would be of major consequence in the long term only (a) if scholastic aptitude is directly related to the mastery of professional skills, (b) if those deficient in professional skills are not screened out prior to graduation, or upon being evaluated as beginning teachers, and (c) if the employment of teachers deficient in professional skills actually produces inferior learning results or other undesirable schooling outcomes.

If the decline in scholastic aptitude of those selecting education as a major is matched against the level of marks received in college, one would be led to conclude that scholastic aptitude differences of the sort described here are not useful predictors of skill mastery within professional preparation programs, at least as determined by professors of education through their marking practices. For instance, a recent student survey in a major Eastern university, which will go unnamed, showed the school of education awarded the highest percentage of A's while being ranked the lowest among the major schools in freshman average SAT scores.

The question of whether declining verbal or math test scores among entering and graduating education majors automatically signal diminishing pedagogical skills, or negative effects on students in American classrooms, is a question so imprecise as to not be directly answerable here. The decline in National Teacher Examination test scores, reported by ETS, suggests, insofar as NTE is a useful measure of the general pedagogical

knowledge required of the prospective classroom teacher, that pedagogical knowledge is declining. However, consider that Summers and Wolfe ("Which Resources Help Learning? Efficiency and Equity in Philadelphia Public Schools," Federal Reserve Bank of Philadelphia, 1975) discovered a negative correlation between teachers' NTE scores and standardized achievement growth for elementary and high school students! On the other hand, Coleman's (Equality Educational Opportunity, 1966) findings show positive correlations net the effects of family background and other school factors, between teacher verbal test scores and student verbal test scores, and the relationship strengthens at higher grade levels. But teacher test scores explained only 7% of the variance in student test scores at the 12th grade level, and less than 1% at the lowest elementary grade level. James Guthrie and his co-authors (Schools and Inequality, 1971) state what they believe to be the significance of these findings on verbal ability:

> The findings can be construed to mean that an intellectual facile instructor is more adept at tasks such as finding means to motivate students, adapting materials to their ability levels, and communicating in ways that make the subject matter more understandable. This is an interpretation that is totally consistent with observation and conventional wisdom (pp. 70-71).

But in my opinion, the important issue here is not empirical, the valiant efforts of social scientists to make it one notwithstanding. The more important question is normative: Should professional teaching skills be expected to produce desired learning results? And is it a reasonable expectation that a definition of professional teaching skills include those cognitive functions reflected in such measures as the SAT? These questions are connected.

Let me address the first question. Is teaching practice accountable for learning results? Can any profession be judged entirely by whether its treatments produce desired results? I believe not on empirical grounds because in most cases the desired results are too ambiguous, or not observable in the short term. Even if the results are observable and unambiguous, it is rarely possible to show a direct and indisputable causal link from treatment to cure. One might think of the result of counseling and psychotherapy which are neither unambiguous nor short term. The same can be said

of teaching.

But there remains the issue of reasonable expectation. A profession would simply cease to have legitimacy at all if it never produced any results that were thought to be causally connected to competent practice. Imagine the situation in which surgeons killed all of their patients, or every patient in psychotherapy was driven incurably mad, or lawyers sent every client to the gallows. Given these results, the basis of a claim to authority would be preposterous. Even the raindancer must produce rain sometime, the priest must save some soul sometime, and the witch doctor must effect some cure sometime. Otherwise, there would be no grounds on which to exclude anyone from membership in the professions, ministries, or crafts. Even in teaching some results under some conditions must be argued to be connected to professional practice. The question is which results at which time.

Is it a reasonable expectation that school teachers ought to instill in students the ability to read and write sentences, recognize common words, add, subtract and multiply numbers with at least minimal proficiency after 12 years of schooling? If it is not, then the discovery that such skills fail the test of minimal proficiency and have diminished would be irrelevant. It seems to me such basics are expected, school teachers are judged responsible for their development at least by the public, and the discovery that student skills have diminished is a cause for public alarm. Here is where the questions are linked. If the education profession wishes to make the claim that students' knowledge and skills should be produced by teachers in schools, and I will argue that it must, then it must also be able to make the claim that its members are competent in the basics they teach.

To the extent the teaching profession cannot claim to be literate and to foster the development of minimal literacy in the young, it will suffer serious loss of its fundamental claim to authority. Otherwise, it would be reasonable to contest the legitimacy of the teaching profession to claim any exclusive prerogative in the conduct of schooling, the compelling of communities to set aside property rights through taxation, or the enforcement of compulsory attendance (I am encouraged in this view by the Robinson v. Cahill and Pauley v. Kelley decisions which have defined "thorough and efficient

education" precisely in terms of learning results).

In this sense, the education profession must be able to claim that schooling is essential precisely because it fosters the development of certain skills and attitudes among the young which eventually strengthen the community's welfare and protect those very political rights that are subordinated through taxation so that schooling is freely available for all. Under these circumstances, it will be necessary to argue that teaching results in learning, and it will be necessary to argue that the teaching profession possesses competencies which at a minimum are believed to be decisive in producing those learning results, even if the case can never be empirically demonstrated. Among those competencies, it is presumed, will be the ability to add, subtract, read and write. If we discover that these competencies of teachers (adding, subtracting, reading and writing) have declined or are low to begin with, then one should expect an enormous public outcry.

I believe that it is important to realize that defining teacher certification standards statutorily, in terms of just these kinds of skills, at a time when these skills appear to be declining, accompanied by public awareness of declining student test scores, reinforces further the public belief that student competency and teacher competency are causally connected. They may not be, or at least we may not be able to show that they are, but a public perception seems to be emerging that solving one will solve the other.

But is there really any consensus on what kinds and levels of academic skill competent teachers need to have? Is an SAT, NTE, GRE, or ACT score a fair indicator of that skill level? Do teachers need to have proficiency levels equal to people in other professional fields? What difference does it make if in fact teachers graduating from college have skill levels below average for other graduates?

What Does the SAT Measure?

The SAT is not a test of minimal literacy. NAEP scores would be a better indicator. The SAT is a test of high-level reading and in the opinion of Slack and Porter (Harvard Education Review, May 1980) tests

achievement of a type not likely to be gained solely in school work, although learning experiences in school are likely to have some effect on scores. Farr and Olshavsky (Phi Delta Kappan, April 1981) state, "SAT scores tell us very little about the basic literacy of high school upper classmen, and there is no evidence of widespread lack of basic literacy for the population."

In reviewing sample SAT verbal items from a practice book, Farr and Olshavsky suggest that successful test takers would certainly have to be able to distinguish between definition and connotation, given such words as "saturnine", have a keen understanding of syntax, an awareness of prevailing value systems that must have influenced the test maker, and an ability to select between the obliquely correct and the somewhat more precise. On the other hand, NAEP test items, and minimum competency tests modeled after the NAEP, require substantially lower levels of literacy. NAEP tests the kinds of reading typically encountered in everyday experiences requiring minimal evaluation and inference.

What do we expect of teachers? Do we expect minimal reading skills, or high level reading skills as measured by the SAT?

What do the state certification laws imply? Take, for example, the new Massachusetts certification requirements. Common verbal standards for all new classroom teachers include the following:

> 'The effective teacher communicates clearly, understandably, and appropriately. To meet this standard, the candidate will demonstrate that he or she:
>
> 1. gives clear and concise explanations and directions
> 2. frames questions so as to encourage inquiry
> 3. uses appropriate metaphors, examples, and illustrations
> 4. makes the goals of teaching and learning clear to students
> 5. uses language appropriate to the age, developmental stage, special needs, and social, racial, and linguistic background of his or her students
> 6. serves as an example of clear and effective oral and written communications
> 7. listens to student.
> 8. communicates effectively with parents.'

Examination of common instruction/evaluation standards suggests a strong expectation of verbal and conceptual ability of the teacher. Examples from the Massachusetts law include the following:

'1. understands the needs and interests of his or her students and designs or adapts the curriculum to meet those needs and interests

2. relates the elements of instruction sequentially to each other, to other fields of knowledge, to students' experiences, and to long-term goals

3. understands developmental psychology, and the relationships between stages of growth

4. teaches, as necessary, the basic academic skills (reading, communication, mathematics) related to the goals of instruction

5. uses evaluative procedures appropriate to the age, developmental stage, special needs, and social, racial, and linguistic background of his or her students, and corrects for any ethnic, racial, or sexual bias in evaluation.'

By state law, beginning in 1981 new teachers must show evidence of such skills as a prerequisite for certification in Massachusetts.

If we take seriously the idea that teachers really ought to be able to do these things, and do them effectively, then we are demanding communication skills of a high level. We are not talking simply about basics.

I offer the following propositions: (a) the average academic skills of new people preparing for teaching careers do not match the standards expected in the foregoing discussion; (b) this condition is consistent with a change in the college-bound population seeking careers in professional fields generally; (c) the causes of this condition have to do with social, demographic and economic factors coupled with the response of college-bound populations to those factors plus the adjustements made by higher education institutions adapting to declining student enrollments.

I also suggest that certification changes which lengthen and intensify teacher preparation are likely to have counter-intuitive effects on the problem for several reasons. While certification may influence exit requirements, the real problem rests with the selection of candidates to be trained, and, in a deeper sense, with the nature of the profession and those attracted to it. Certification reform may speak to the teaching

competencies for which faculties of education are responsible, but the actual development of verbal and quantitative skills is the responsibility of the arts and sciences faculty. The teacher who cannot write effectively, or explain number sets, or speak convincingly in public has failed to develop such basic skills under the watchful eyes of professors of English, mathematics, and the humanities. If we wish to take seriously the idea that teacher competencies include high level scholastic skills, and my reading of the Massachusetts certification law implies that we do, then it must be recognized that the entire college faculty is responsible for preparing teachers because 50% or more of the undergraduate preparation of teachers takes place in the arts and sciences departments. And, finally, the ultimate selection process rests with school districts. Given minimum competency requirements, the latitude will remain broad. My earlier findings do not suggest that school hiring practices now screen new teachers on the basis of the aforementioned academic ability, and I have no reason to believe that competency-based certification will change that condition much.

I also wish to suggest that teacher testing will not produce any substantial change in the scholastic aptitude scores of persons entering the profession. I suggest this because I think the present arguments for testing fail to understand the consequences of restricting entry to this profession to those who might comprise the upper quartile or even the upper one-half of academic ability. Apart from the question of whether such persons would also possess other characteristics important to teaching (motivation, ability to relate to children, personal warmth), although I see no reason to believe they would not, such a restriction would mean that many of the people in teaching and related careers today would have been closed out of the field, just as they already are from medicine and law. Consider that the majority of nigh school seniors who wish to enter teaching come not only from families with modest annual incomes, but also rank below mean level on most achievement and aptitude tests taken by college-bound high school seniors. The social costs of restricting entry to the teaching profession on the basis of test scores would be high. The financial consequences would be even greater. Given such a restriction,

school boards would find themselves competing with corporate boards, consulting and research firms, law firms, hospitals, and medical centers for the higest academic achievers in this society. The present shortage of science and math teachers is slight in comparison to the problems such a policy would create.

I believe that in fact there may be enough public clamor to induce some school boards and some states to adopt testing but I do not believe the public has the slightest idea what such a policy would mean if it actually restricts hiring on the basis of scholastic aptitude. What it might mean would be bankruptcy for all but the wealthiest school systems. We may have teacher testing, but it will not result in any major change in the academic quality of persons in the field, or entering the field, because no mass public education system could exist if the acquisition of its professional workforce meant competing for this society's most scarce human resources.

Solutions

If we wish to select students with higher academic abilities, then we have to understand more about how the system qua system operates in its larger context.

The decline in test scores appears to be, to a large extent, the legacy of the collapsing job market for educators. Since 1970 the public schools have generally been oversupplied with new teacher graduates, and since the mid-1970's have been oversupplied in every specialty. Fewer than one-half of the new teacher graduates are being placed in teaching jobs. Depending upon what assumptions one uses, the teacher surplus from 1969 to 1984 will approach 1.4 million. The graduates who do not find teaching jobs show higher rates of unemployment and underemployment than graduates as a whole. As a result, fewer students are majoring in education and among those who do, test scores are significantly lower. The students with higher scores are migrating to growth fields.

The oversupply of teachers has been compounded by a number of factors: (a) a general oversupply of all college graduates relative to the available slots in the economy; (b) government policies which have further inflated

the oversupply condition; that is, by investing more in higher education during the 1970s we simply caused the overall college job market to reward less (there was more than a 300% increase in HEA IV monies and more than on-half of all education majors qualified for such funds while that sector of the economy which absorbs college graduates was shrinking relative to the economy as a whole); (c) cumulative decisions of institutions, acting individually, in seif-interest, to gain a greater share of the shrinking teacher market, had the effect of throwing gasoline on a fire; and finally (d) there was a much larger college preparatory cohort than in the previous decade -- which alone would have created problems.

Schools of education reacted to declining applications like the plague. They intensified efforts to recruit and retain students, and at the same time relaxed standards in order to capture more of those who did apply. The primary result in the field of education was a rapid upsurge in the proportion of teachers in the teacher job applicant pool who could not successfully find classroom teaching positions. This condition has been intractable throughout the entire decade, and will likely continue well into the 1980s before abating.

The upsurge in the size of the teacher reserve pool is amplified by the overall collapse of the college job market (a condition documented by Harvard economist, Richard Freeman). Had those sectors of the economy which employ large numbers of college graduates, other than the education system itself, continued to grow at the rate observed in the 1960s, teachers in the reserve pool would have had more job opportunities commensurate with their expectations of professional status, if not in teaching. A Massachusetts survey in 1975 showed that of the new teacher graduates not placed as teachers, 80% felt they were not only underemployed but indicated an active interest in finding a teaching job one year after graduation. In effect, they were forced to be part of the active teacher reserve pool because there were not alternatives.

The oversupply of college graduates in general produced a domino effect with college graduates being forced down the labor queue, finding themselves underemployed, and in some cases unemployed, and with lower salaries than expected and a sharply reduced return on their investment

in a college education. The fields hardest hit, other than education, namely the humanities, arts and social sciences, have responded much like education, with the same predictable results. I mention the overall problem of the college market because of its obvious connection to the teacher job market.

A shrinking teacher market in the 1970s, rather than the robust one in the 1960s, has compounded the job-hunting problems of arts, humanities and social science graduates, many of whom entered teaching in those golden years of teacher shortages. The coincidental shrinkage of government employment (which of course will continue) in fields other than education, and the general economic recession of the early 1970s, deepened the problems of the teacher market by reducing job options otherwise available to unplaced teachers.

Long Term Effects

One of the things we have learned from this is that the education system as a whole is not homogeneous and capable of simply retaining its essential shape and capacities on a smaller scale -- unlike a face on a balloon when some of the air is let out. Because of the capital producing nature of the system, some parts exist to serve other parts. When more teachers are needed, more professors of education must be produced by the same system. Sudden shrinkage or cessation of growth grotesquely distorts the shape of the whole.

Earlier growth in demand for teachers produced a chain letter effect on college expansion, and not just in teacher preparation programs. A 50% increase in undergraduate demand produced a 100% increase in graduate enrollments. Once growth in demand for teachers stopped and undergraduate enrollments declined, there ceased to be justification for hiring new faculty. The system draws Ph.D.'s austensibly to teach, but retention, tenure and promotion rely on devoting a considerable amount of time to research and writing. Yet hiring is possible only when teaching slots are open. Legislatures and government officials control budgets and they hire professors to teach. The same is true of trustees in private institutions. Once the chain letter is broken and demand dries up, faculty

ranks in education are affected by a loss of people who would seek to prepare for faculty posts, as well as students preparing for other education careers now dampened by public school retrenchment. Research assistanceships disappear. Research teams are dissolved. New faculty with new ideas cannot be hired. There is a real threat here to knowledge development in this field. Instead of declining enrollments signalling increased funds for research and development, just the opposite seems to have happened in education. Federal research interest seems to rise and fall inversely with boom and bust periods in education -- drying up just when needed most to support faculties as student tuition decreases.

We are seriously challenged to devise a system that attracts the most academically gifted students into education during a period of market stress. In order to survive we must have students, but we simply are not going to be able to rely on the public school market for those students, nor can we rely on traditional government R & D funds for a bail-out. To do either simply means further dismantling of education departments and programs.

Strategies

Any strategy that directly or indirectly produces more new graduates, no matter what their test scores, who will enter the teacher applicant pool, without increasing job opportunities for those in that pool, is going to be self-defeating, and viciously so: the more successful such strategies are the more self-defeating they will be. But that is precisely the strategy being followed by many colleges. On the other hand, any individual action that reduces output would be suicidal. The driving force behind this problem, simply put, is too many people chasing too few jobs. No one institution can alone solve it, but collectively, action thus far has, if anything, worsened the problem.

The strong temptation is to lean toward capturing a larger share of a shrinking market by offering a teacher preparation program of such superior quality that it will attract more gifted students from the pool who will go into teaching. Even to the extent it is actually possible to create such differences between programs, differences not only that

students recognize and respond to but that the job market rewards, the market-share strategy will not solve the larger problem. The better programs would simply get more students, the poor programs fewer, but the net result will still be too many people chasing too few jobs -- unless the competition is put out of business. If every program is successful in improving its abilities to capture market share, then the market share strategy is not only defeated but if all succeed to the extent of enlarging the pool of students who attempt to enter the teaching field, the result is disastrous. We have simply overgrazed the range.

In thinking through this problem as part of a joint effort with Dr. Barry Richmond of Dartmouth College to build a computer simulation supply/demand model, I have come to this conclusion: Institutions can act to reduce the teacher job applicant pool, and not at the same time further reduce enrollments below a program survival level only under <u>one condition: they must prepare education majors with skills that enable them to find professionally rewarding positions in non-school as well as school settings</u>.

How do we do that? Colleges of education must radically redirect their missions. In my opinion this would be an important task apart from any other considerations thus far discussed. The fact that colleges of education have existed primarily to train teachers and school specialists is abundantly clear in the decline of education departments which has accompanied the decline in job opportunities for teachers. When we don't need teachers we don't need education departments. Graduate departments temporarily benefitted from the credential chase caused by competition for scarce jobs, but will face serious declines as well. The teaching force is credential-saturated now, and new teachers who would ordinarily go into graduate schools are in increasingly short supply. The trend is clear. The absolute numbers of people who could potentially enter graduate programs has been shrinking for a decade. Once the credential crunch stops, graduate schools of education face serious decline.

The alternative rests with attracting a new client base. Not only is the old pasture overgrazed, but desertification may not be far behind! An expanded client base is needed in education. Consider this irony:

while schools shrink, the major corporations of America invest billions of dollars in educational activities ranging from employee technical skill development to executive seminars, and that investment is growing. The big computer companies in Massachusetts employ a virtual army of educators who train employees, customers and each other. Digital Equipment Corporation estimates that its professional employees earn $1.5 million over a lifetime, and that to derive a greater return on that investment, it must continuously upgrade skills. Digital employs 1,500 educators, or HRD specialists.

What are the teaching competencies needed in HRD? Many of the same skills colleges of education now teach; e.g., curriculum design and evaluation, media and instructional technology, human relations training, planning and problem-solving. But, if colleges of education wish to enter this market, they will be <u>forced</u> to cooperate with other faculties. No credible HRD program could exist without linkage with a school of management. Instructors at Digital Equipment Corporation must have a background in computer programming beyond the skill level offered in Boston University's School of Education. Our students must take course work with the computer science faculty. Schools of education have something to offer in generic teaching skills, but faculties will have to retool, will have to establish new field networks, and devote serious energy to planning. Simply repackaging old courses under new labels will not suffice.

But how will this affect the talent pool for public school teaching? In my opinion, positively. The creation of alternatives for education majors, if taken seriously, is the <u>only way</u> to reduce the chronic oversupply of new graduates now being singly prepared for one educational role; namely, public school teaching. By <u>collectively</u> relieving pressure in teacher job market, the attractiveness of colleges of education will be increased, and reasonable selectivity of applicants restored to the field. I am absolutely convinced that colleges of education will not voluntarily cut back the supply side through raising standards unless and until new sources of students are developed. That won't happen in this decade without credible new programs in education that promise career opportunities for high school graduates entering colleges and universities.

What appears to be inevitable, with or without institutional action by colleges of education, is that states will restrict and lengthen teacher certification requirements in response to pressure to restrict supplies of teachers. That may be a solution some welcome, but it comes at a time when the supply of new graduates is already dwindling (although the reaction is about five to eight years too late). Its effect in the 1980s may be to hasten a shortage, or actually create one in science and math and selected other fields. In the long term, this strategy does do one thing. By extending the length of preparation for future teachers and increasing costs of preparation for students and institutions, it will restrict teacher supply, and it will reduce the attractiveness of colleges of education. However, graduates will still end up in the teacher job applicant pool, but even more intensely invested in classroom teaching.

One of the things I am most concerned about with the effort to regulate the quality and quantity of new teacher graduates through extending exit standards is that such an approach requires schools of education to expend more energy strengthening and enlarging the very capacities they need least if they are to create new alternative options for students in educational careers outside of public schools. Schools of education have not responded to the growth of learning needs in industry, health care, and social services precisely because the entrenched faculties of education are heavily invested in preparing school teachers. The organizational motif of most schools of education I am aware of is suited to preparing teachers and school specialists but not adult educators. In order to respond to the larger education needs of this society, education faculties will not only have to cooperate with other departments, but fundamentally revise the education curriculum. That effort is simply not compatible with more demands for certifying school personnel in a more intense and specialized manner.

In conclusion, it is my view that we must broaden what is meant by the term, "educator". Talented students must see that they have career options in education, or we simply will lose them to other fields. I am optimistic that we can create challenging and rewarding options for educators in human resource development, and that employment opportunities will

be there, given this society's manpower development needs for the remaining one-fifth of this century.

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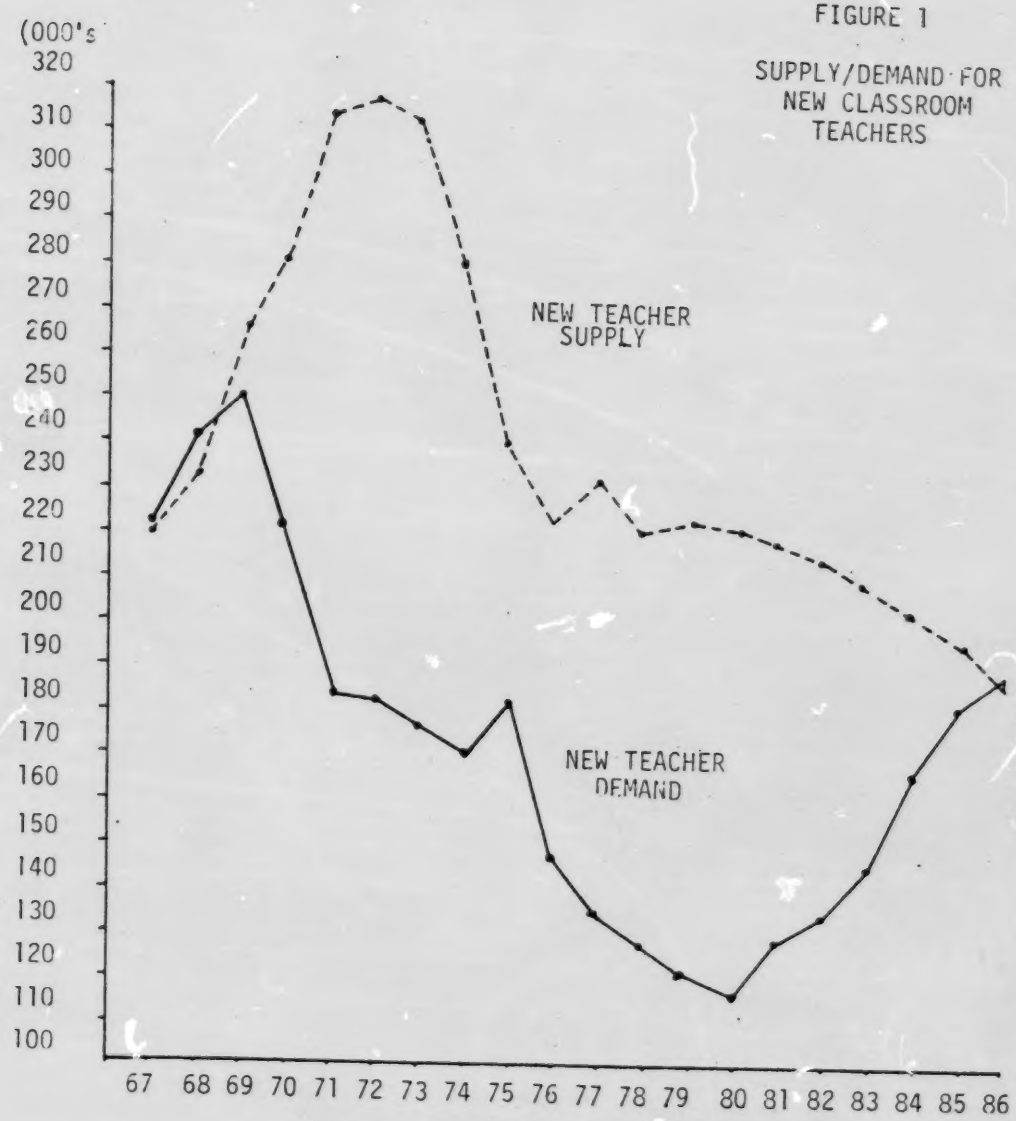
ATTACHMENTS

ATTACHMENT 1

Figures 1-7

FIGURE 1

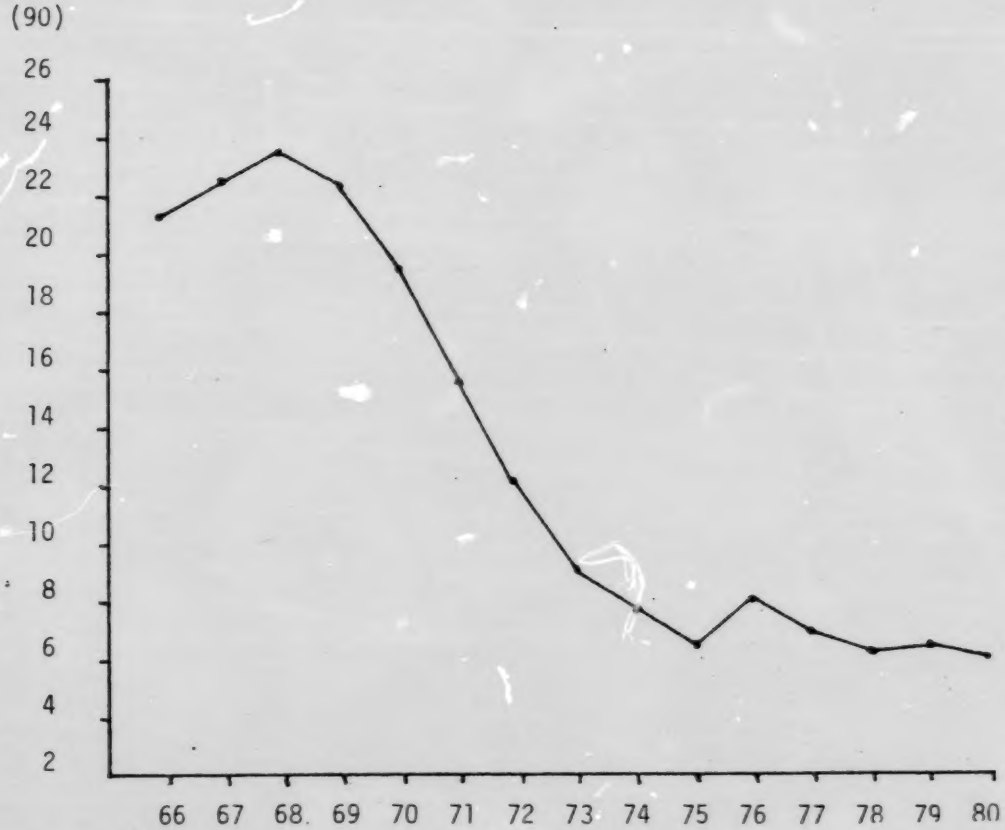
SUPPLY/DEMAND FOR NEW CLASSROOM TEACHERS



SOURCE: PROJECTION OF EDUCATIONAL STATISTICS to 1986-87, TABLE 21, USOE, 1977.

FIGURE 2

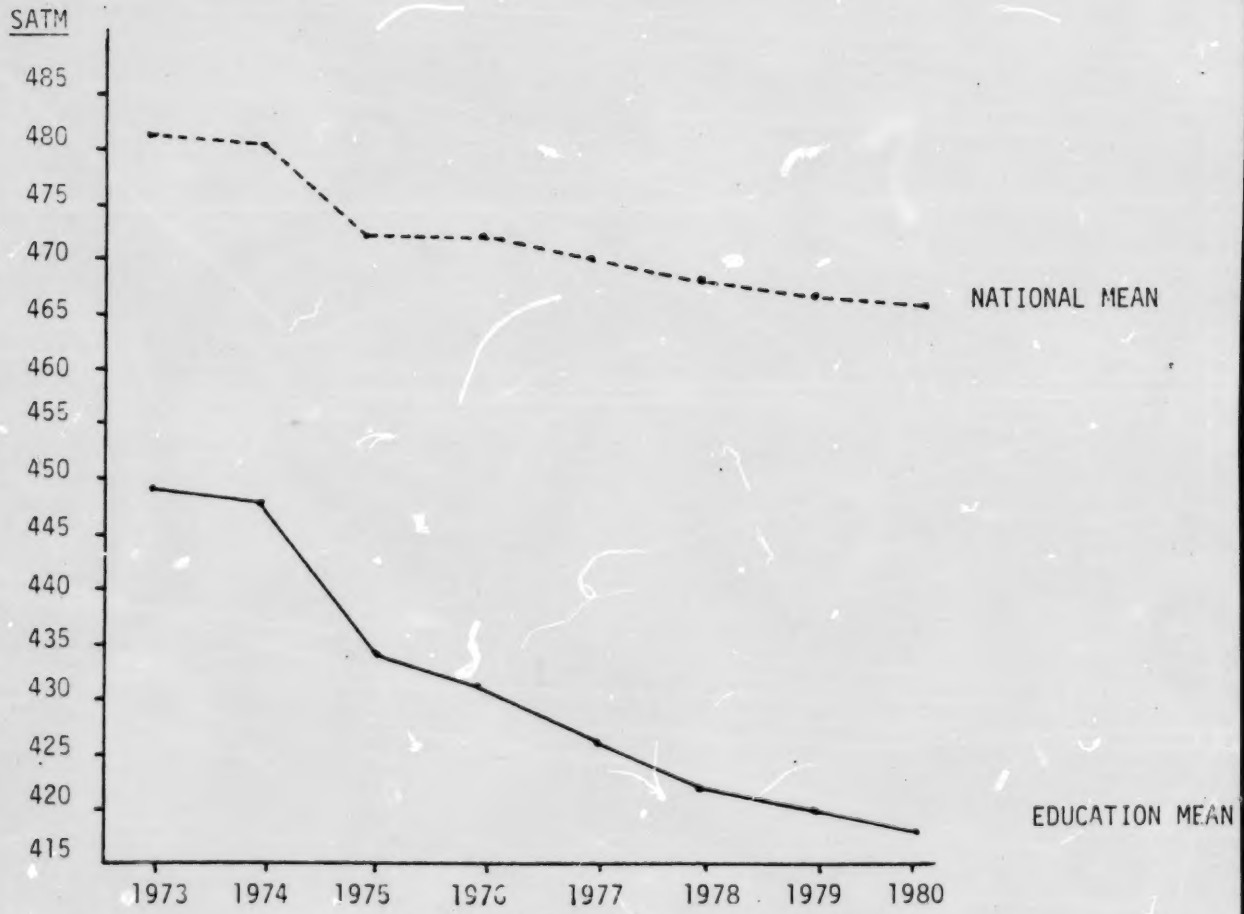
COLLEGE FRESHMEN
SELECTING EDUCATION
AS A MAJOR



SOURCE: AMERICAN COUNCIL ON EDUCATION, NATIONAL NORMS FOR ENTERING FRESHMEN 1966-1972; THE AMERICAN FRESHMAN: NATIONAL NORMS, 1973-1980. (NOTE: PROBABLE FIELD OF OCCUPATION: ELEMENTARY AND SECONDARY TEACHER--ALL INSTITUTIONS. DOES NOT INCLUDE OTHER EDUCATIONAL OCCUPATIONS.)

FIGURE 3

SAT MATH MEANS FOR COLLEGE-BOUND SENIORS
SELECTING EDUCATION AS A COLLEGE MAJOR

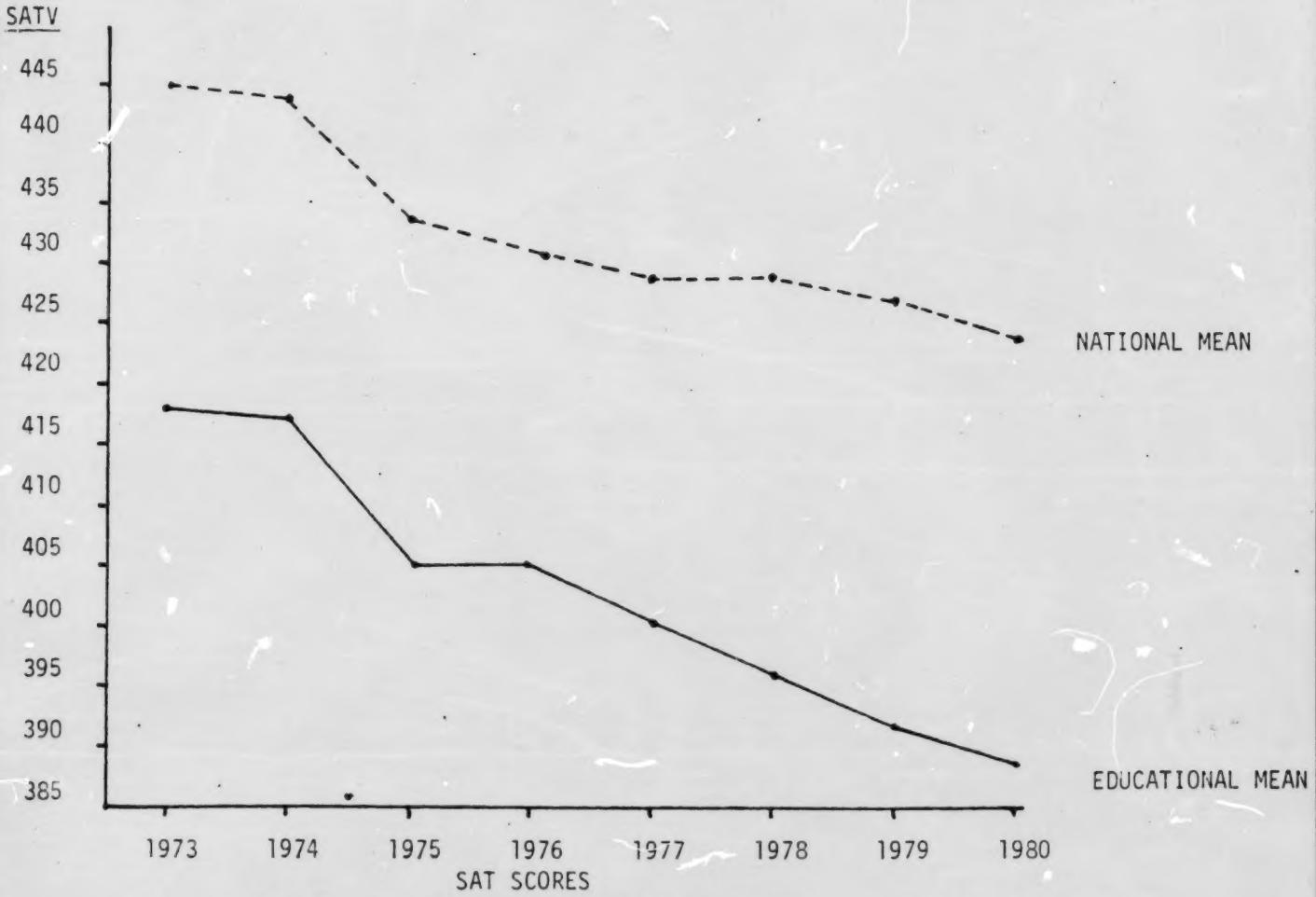


SOURCE: NATIONAL COLLEGE-BOUND SENIORS INTENDED AREAS OF STUDY - FIRST CHOICE COLLEGE BOARD. 1972-1979-1980

(NOTE: 1977 PREPARED SEPARATELY BY COLLEGE BOARD.)

FIGURE 4

SAT VERBAL MEANS FOR COLLEGE-BOUND SENIORS SELECTING EDUCATION AS A COLLEGE MAJOR



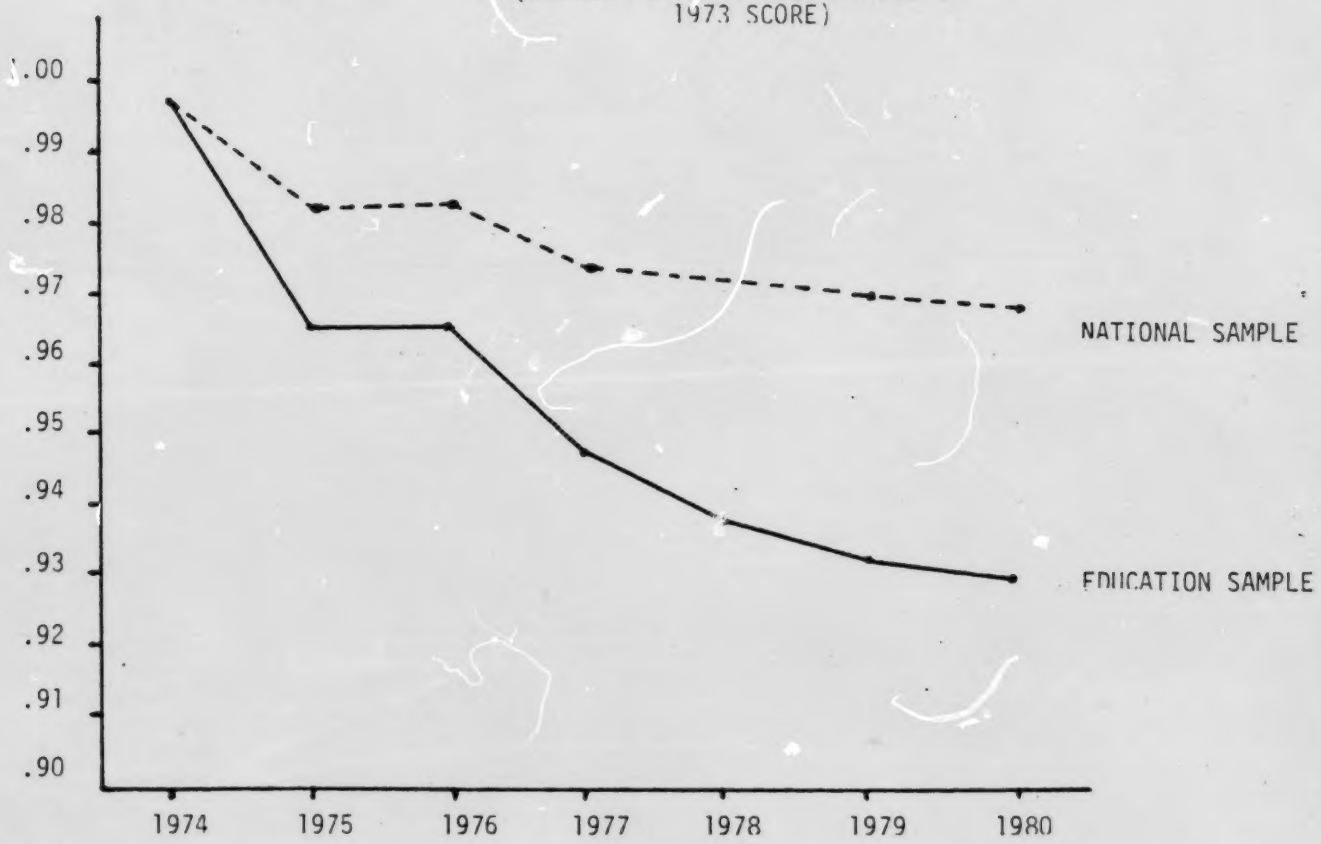
SOURCE: NATIONAL COLLEGE-BOUND SENIORS INTENDED AREAS OF STUDY - FIRST CHOICE COLLEGE BOARD 1972-1979-80.

(NOTE: 1977 PREPARED SEPARATELY BY COLLEGE BOARD.)

FIGURE 5

SAT MATH SCORES. PERCENTAGE DECLINE.
COLLEGE-BOUND SENIORS SELECTING
EDUCATION AS A COLLEGE MAJOR

(SCORES FOR 1974-1980 RATIOS OF
1973 SCORE)

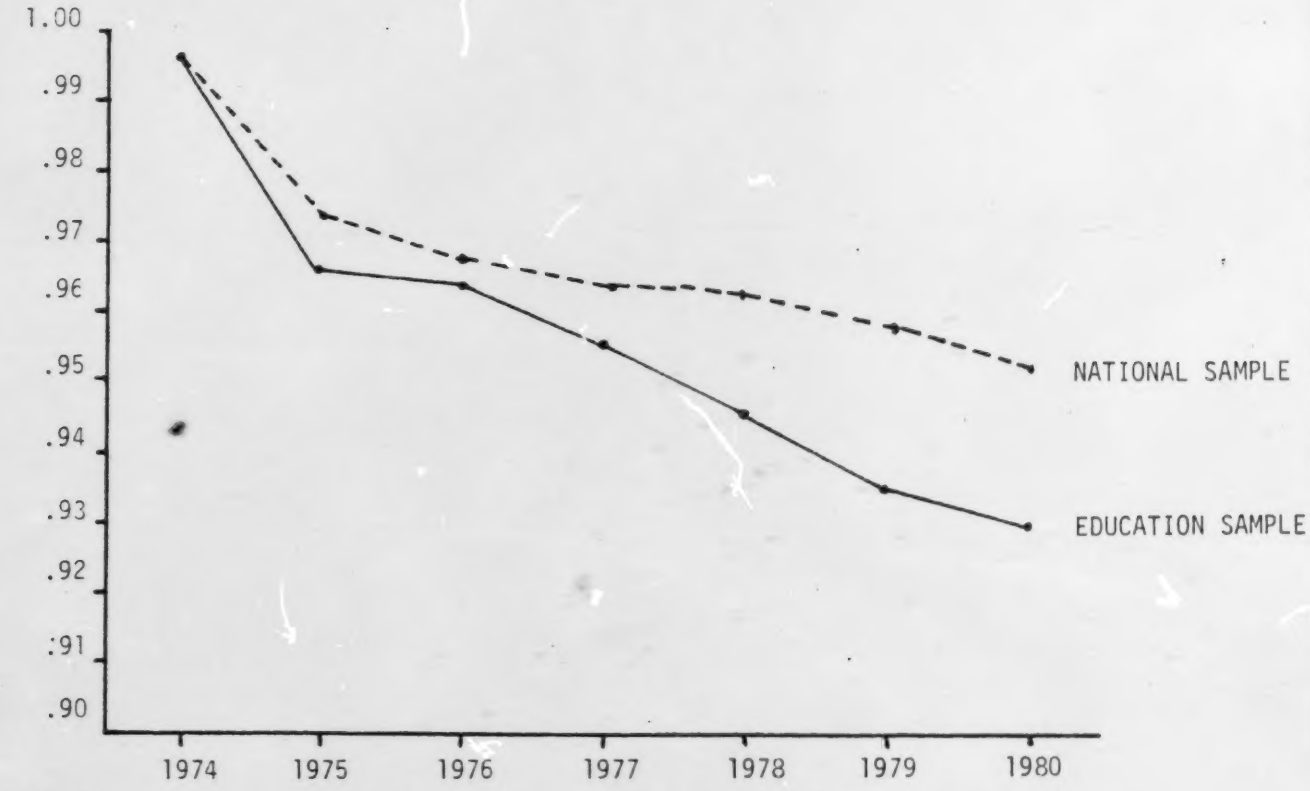


1973:1

SOURCE: NATIONAL COLLEGE-BOUND SENIORS
INTENDED AREAS OF STUDY - FIRST
CHOICE COLLEGE BOARD 1972-1979-
1980.

FIGURE 6

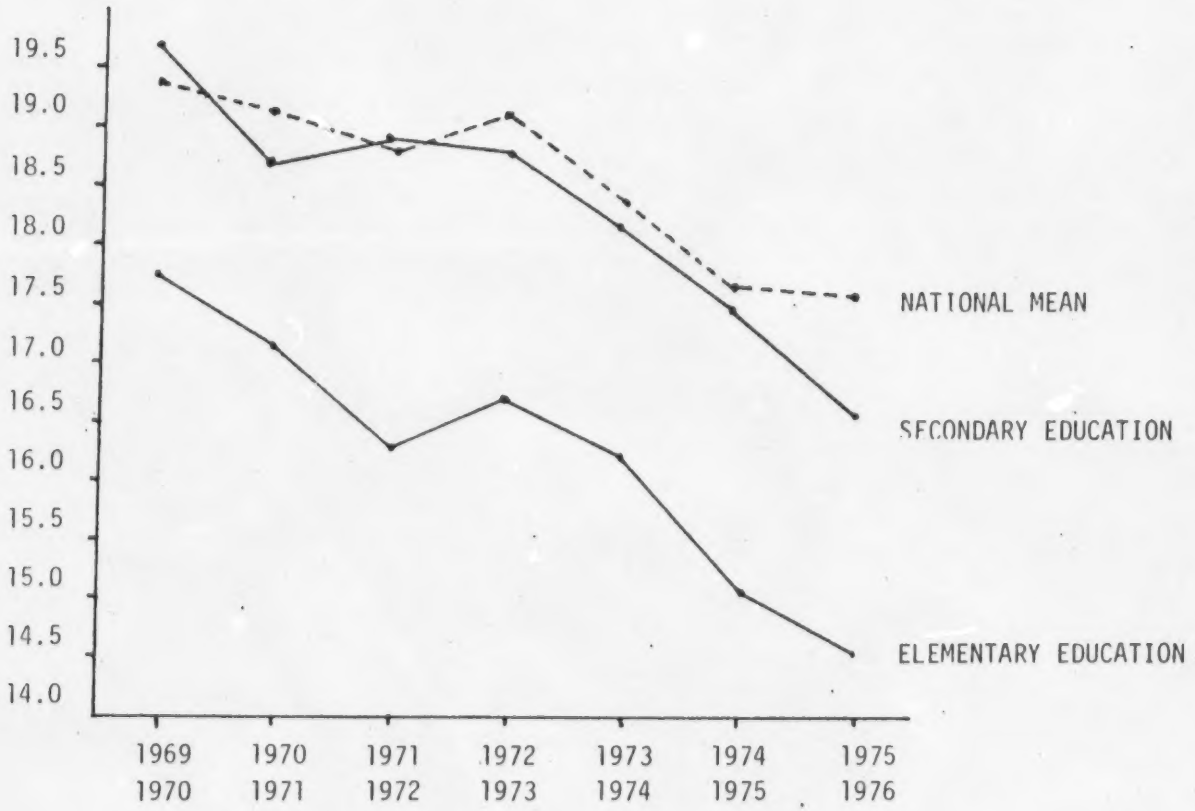
SAT VERBAL SCORES. PERCENTAGE DECLINE.
COLLEGE-BOUND SENIORS SELECTING EDUCATION
AS A COLLEGE MAJOR
(SCORES FOR 1974-1980 RATIOS OF 1973 SCORE.)



SOURCE: NATIONAL COLLEGE-BOUND SENIORS INTENDED AREAS OF STUDY - FIRST CHOICE COLLEGE BOARD, 1972-1979-1980.

FIGURE 7

ACT MATH MEANS. COLLEGE-BOUND SENIORS SELECTING ELEMENTARY AND SECONDARY EDUCATION MAJORS, 1969-1975



ACTM

SOURCE: ACT SPECIAL PROCESSING CREATION, JULY 26, 1977 AND DECEMBER 12, 1977.

A T T A C H M E N T 2

Tables 1-14

Table 1

SAT Math and SAT Verbal Means For College-Bound Seniors Selecting Education and Arts/Sciences Areas as First Choice College Majors, 1972-1979

	1972-1973	1973-1974	1974-1975	1975-1976	1976-1977	1977-1978	1978-1979	1979-1980
				SATV				
Business	409	406	406	413	402	401	400	399
Art	440	432	435	438	412	408	404	402
Bio. Sci.	493	488	481	483	475	475	472	469
English	500	496	488	489	504	504	505	507
For. Lang.	491	483	481	485	481	476	475	472
Math	481	479	463	472	464	464	459	455
Music	465	462	448	452	445	439	437	436
Phil.	479	476	469	478	467	466	465	460
Physic Sci.	505	503	501	506	500	499	498	495
Soc. Sci.	476	463	465	464	456	457	455	456
Engineering	468	465	450	452	448	448	445	444
Education	418	417	405	405	400	396	392	339
National	445	444	434	431	429	429	427	424
				SATM				
Business	463	457	461	471	453	447	447	446
Art	451	441	445	443	425	422	421	419
Bio. Sci.	533	528	525	530	515	511	507	506
English	481	473	465	469	478	476	478	481
For. Lang.	498	494	486	487	483	477	476	475
Math	595	584	580	594	588	585	580	577
Music	487	479	464	468	463	456	456	455
Phil.	500	489	484	495	487	481	482	477
Physic. Sci.	570	568	565	572	572	566	561	560
Soc. Sci.	490	477	476	475	474	472	472	473
Engineering	548	554	541	550	546	540	536	535
Education	449	448	434	431	426	422	420	418
National	481	480	472	472	470	468	467	466

Source: College Entrance Examination Board. National College Bound Seniors. Sub-Career Fields, Intended Areas of Study. First Choice. 1972-1979.

Table 2

SATM and SATV Scores of College Seniors
by Field of Study, 1976

FIELD	MEAN	STD. DEV.	N
	SAT Math		
	527.1122	108.1065	(334892)
AG. & HOME EC.	515.7805	91.0730	(3546)
BUSINESS	529.6116	90.3155	(39590)
OFFICE CLERICAL	408.5083	57.6524	(1296)
COMPUTER	582.9105	72.2620	(3406)
EDUCATION	475.8848	95.7827	(50524)
ENGINEERING	624.6569	89.4338	(12021)
VOTECH	501.7814	116.6677	(864)
HUMANITIES - ARTS	528.3408	96.1730	(33321)
HEALTH RELATED	513.0300	91.7767	(18557)
PUBLIC SERVICE	498.2004	105.5481	(4209)
PHY. SCI. & MATH.	631.0436	94.5307	(14140)
SOCIAL SCIENCE	532.3298	104.2261	(49522)
BIOLOGY	573.3045	112.7788	(18380)
PROFESSIONAL	550.5878	109.2926	(15214)
OTHER	498.6239	107.8514	(6936)
UNDECIDED	526.7357	64.3147	(1257)
MISSING	510.1777	112.1877	(62108)
TOTAL CASES = 502707			
MISSING CASES = 167815 OR 33.4 PCT.			
	SAT Verbal		
	491.2732	105.9264	(335876)
AG. & HOME EC.	472.0700	84.4113	(3546)
BUSINESS	476.7067	94.7734	(39590)
OFFICE CLERICAL	339.6273	71.0316	(1296)
COMPUTER	460.6417	89.5100	(3406)
EDUCATION	445.4050	95.9800	(50878)
ENGINEERING	524.0096	104.0270	(12021)
VOTECH	432.2041	193.2452	(864)
HUMANITIES - ARTS	534.3666	99.0534	(33321)
HEALTH RELATED	498.0776	79.8529	(18557)
PUBLIC SERVICE	464.3112	80.3026	(4209)
PHY. SCI. & MATH.	548.7494	109.3708	(14250)
SOCIAL SCIENCE	509.1446	106.3391	(49937)
BIOLOGY	540.2169	110.2486	(18380)
PROFESSIONAL	517.7707	96.8162	(15214)
OTHER	480.5949	111.8850	(6936)
UNDECIDED	491.4542	91.9172	(1257)
MISSING	467.9293	103.6412	(62214)
TOTAL CASES = 502707			
MISSING CASES = 166831 OR 33.2 PCT.			

Source: National Longitudinal Study, May 1, 1978.

Table 3

ACTE and ACTM Scores of College Seniors
by Field of Study, 1976

FIELD	MEAN	STD. DEV.	N
	ACT English		
	20.4832	4.5872	(173296)
AG. & HOME EC.	18.2418	4.5986	(4977)
BUSINESS	19.9984	4.5724	(22980)
OFFICE CLERICAL	19.7438	1.6178	(1700)
COMPUTER	18.3845	3.1968	(1228)
EDUCATION	19.5869	4.1535	(29341)
ENGINEERING	22.5578	2.6769	(7337)
VOTECH	10.0000	0.0	(301)
HUMANITIES - ARTS	22.8414	3.6458	(13868)
HEALTH RELATED	21.8585	3.7339	(8354)
PUBLIC SERVICE	16.7081	3.9049	(1803)
PHY. SCI. & MATH.	23.3270	3.8848	(5227)
SOCIAL SCIENCE	20.7651	4.2757	(20868)
BIOLOGY	22.1188	4.5678	(6780)
PROFESSIONAL	22.1326	3.9464	(10483)
OTHER	20.7819	2.9045	(3416)
UNDECIDED	23.3003	3.0536	(484)
MISSING	19.0617	5.2782	(34150)
TOTAL CASES = 502687			
MISSING CASES = 329392 OR 65.5 PCT.			
	ACT Math		
	22.5702	6.8789	(173531)
AG. & HOME EC.	20.0391	6.0387	(4977)
BUSINESS	24.7628	5.9609	(22980)
OFFICE CLERICAL	16.4338	4.9806	(1700)
COMPUTER	26.1813	5.6480	(1228)
EDUCATION	20.0004	6.1550	(29451)
ENGINEERING	28.3702	4.3254	(7337)
VOTECH	17.0000	0.0	(301)
HUMANITIES - ARTS	23.2045	6.0685	(14118)
HEALTH RELATED	23.0588	6.4600	(8354)
PUBLIC SERVICE	17.2952	5.3435	(1803)
PHY. SCI. & MATH.	28.2922	5.3742	(5227)
SOCIAL SCIENCE	21.0685	6.5020	(20868)
BIOLOGY	27.2122	5.3827	(6780)
PROFESSIONAL	25.7720	5.2781	(10483)
OTHER	21.9690	5.4379	(3416)
UNDECIDED	25.9652	7.2444	(484)
MISSING	20.6973	7.6341	(34026)
TOTAL CASES = 502687			
MISSING CASES = 329156 OR 65.5 PCT.			

Source: National Longitudinal Study, May 1, 1978.

Table 4

SATV and SATM Scores of Graduating College Seniors Majoring in Education Employed or Not Employed as Teachers, 1976-77

EMPLOYED AS TEACHER	MEAN	STD. DEV.	N
	SAT Math		
	475.8843	97.7840	(50524)
YES	473.7529	85.3945	(23696)
NO	477.7668	104.0670	(26828)
	TOTAL CASES = 79080		
	MISSING CASES = 28556 OR 36.1 PCT.		
	SAT Verbal		
	471.1382	96.0289	(246)
YES	471.3793	85.7488	(116)
NO	470.9231	104.6844	(130)
	TOTAL CASES = 406		
	MISSING CASES = 160 OR 39.4 PCT.		

Source: National Longitudinal Study, May 1, 1978.

Table 5

NLS Vocabulary Test Scores of College Seniors
by Field of Study, 1976

FIELD	MEAN	STD. DEV.	N
	57.5910	9.0591	(481855)
AG. & HOME EC.	54.1751	7.6934	(8969)
BUSINESS	56.0546	9.0253	(54756)
OFFICE CLERICAL	49.3882	8.0170	(2[illegible]10)
COMPUTER	57.8140	5.4512	(429[illegible])
EDUCATION	55.2463	8.6161	(16660)
ENGINEERING	58.6916	8.7738	(15717)
VOTECH	58.7673	9.1674	(1133)
HUMANITIES - ARTS	61.9814	8.1873	(42867)
HEALTH RELATED	59.5165	7.6008	(22669)
PUBLIC SERVICE	53.9759	9.1165	(6037)
PHY. SCI. & MATH.	60.3290	8.3020	(17247)
SOCIAL SCIENCE	59.5118	8.5164	(66977)
BIOLOGY	60.4320	8.4436	(21163)
PROFESSIONAL	59.8279	8.0302	(23388)
OTHER	59.2438	8.0395	(9045)
UNDECIDED	58.2213	8.9266	(1401)
MISSING	55.5476	9.5965	(107020)

TOTAL CASES = 502712

MISSING CASES = 20857 OR 4.1 PCT.

Source: National Longitudinal Study, May 1, 1978.

Table 6

NLS Reading Comprehension Scores of College Seniors by Field of Study, 1976

FIELD	MEAN	STD. DEV.	N
	57.0168	8.1598	(481855)
AG. & HOME EC.	54.3237	8.0504	(8969)
BUSINESS	56.5204	7.3906	(54756)
OFFICE CLERICAL	45.6448	8.0944	(2510)
COMPUTER	55.4981	4.8923	(4296)
EDUCATION	54.9324	8.4871	(76660)
ENGINEERING	58.3007	7.2390	(15717)
VOTECH	57.9378	6.8986	(1133)
HUMANITIES - ARTS	60.0701	7.2536	(42867)
HEALTH RELATED	59.2206	6.7959	(22669)
PUBLIC SERVICE	55.2876	6.3207	(6037)
PHY. SCI. & MATH.	61.0945	7.4819	(17247)
SOCIAL SCIENCE	58.4985	7.5045	(66977)
BIOLOGY	59.8536	7.0589	(21163)
PROFESSIONAL	59.1778	6.1343	(23388)
OTHER	57.2584	9.2206	(9045)
UNDECIDED	58.6998	4.9385	(1401)
MISSING	54.8664	8.8142	(107020)

TOTAL CASES = 502712

MISSING CASES = 20857 OR 4.1 PCT.

Source: National Longitudinal Study, May 1, 1978.

Table 7

NLS Math Scores of College Seniors
by Field of Study, 1976

FIELD	MEAN	STD. DEV.	N
	58.0750	7.6636	(481955)
AG. & HOME EC.	57.2624	6.5216	(8969)
BUSINESS	59.8465	6.6031	(54756)
OFFICE CLERICAL	49.9569	8.4303	(2510)
COMPUTER	61.6065	3.8212	(4296)
EDUCATION	55.8567	7.3902	(16660)
ENGINEERING	63.9832	3.3007	(15717)
VOTECH	59.2364	6.4596	(1133)
HUMANITIES - ARTS	58.6049	6.8059	(42867)
HEALTH RELATED	59.4186	5.6960	(22669)
PUBLIC SERVICE	54.0602	8.9277	(6037)
PHY. SCI. & MATH.	63.5291	3.9118	(17247)
SOCIAL SCIENCE	58.6488	7.0316	(66977)
BIOLOGY	62.1330	4.7544	(21163)
PROFESSIONAL	60.8877	6.0423	(23388)
OTHER	57.5387	7.4198	(9045)
UNDECIDED	59.0567	3.4299	(1401)
MISSING	55.1010	9.0514	(107020)

TOTAL CASES = 502712

MISSING CASES = 20857 OR 4.1 PCT.

Source: National Longitudinal Study, May 1, 1978.

Table 8

NLS Composite Test Scores of College Seniors
by Field of Study, 1976

FIELD	MEAN	STD. DEV.	N
	228.4848	24.9339	(481855)
AG. & HOME EC.	219.6006	22.3864	(8969)
BUSINESS	228.7950	21.7743	(54756)
OFFICE CLERICAL	193.9880	25.0399	(2510)
COMPUTER	233.8053	13.0094	(4296)
EDUCATION	221.7675	24.2692	(76660)
ENGINEERING	238.3680	18.1826	(15717)
VOTECH	234.1111	19.2441	(1133)
HUMANITIES - ARTS	237.8241	20.7303	(42867)
HEALTH RELATED	235.6697	17.0096	(22669)
PUBLIC SERVICE	217.4200	23.4711	(6037)
PHY. SCI. & MATH.	243.5067	19.2493	(17247)
SOCIAL SCIENCE	232.2663	23.6654	(66977)
BIOLOGY	240.3161	19.4005	(21163)
PROFESSIONAL	237.5642	17.6446	(23388)
OTHER	228.5215	25.5004	(9045)
UNDECIDED	231.7576	20.8486	(1401)
MISSING	219.1700	28.7704	(107020)

TOTAL CASES = 502712

MISSING CASES = 20857 OR 4.1 PCT.

Source: National Longitudinal Study, May 1, 1978.

Table 9

ACT English and Mathematics Scores for High School Sample by Planned College Major, 1970-1975 (10% National Sample)

PLANNED COLLEGE MAJOR	MEAN SCORES BY YEAR						
	1970	1971	1972	1973	1974	1975	N
Education fields:							
E	18.6	18.4	18.1	18.1	17.8	17.6	18,626
M	18.5	18.0	18.0	17.3	16.3	16.1	18,625
Elementary education:							
E	18.0	17.4	17.4	17.9	17.4	17.1	6,808
M	17.1	16.3	16.7	16.2	15.0	14.5	6,808
Secondary education:							
E	18.5	18.4	18.4	18.9	18.2	18.3	2,583
M	18.7	18.9	18.8	18.1	17.4	16.5	2,582
Business administration:							
E	16.3	16.6	16.5	16.1	15.9	15.5	8,150
M	17.8	18.3	18.1	16.6	16.1	15.7	8,148
Nursing:							
E	18.4	18.1	17.6	17.4	17.2	16.8	10,649
M	17.7	17.0	16.7	15.8	15.1	15.2	10,645
Sociology:							
E	18.0	18.3	17.9	17.7	16.8	17.5	2,204
M	17.3	18.0	16.7	16.7	14.4	14.8	2,204
Engineering fields:							
E	17.9	18.1	18.3	17.6	18.0	18.0	10,698
M	23.3	23.9	23.9	22.0	22.9	22.7	10,697
Chemical engineer:							
E	26.0	22.5	21.3	19.8	20.8	20.5	592
M	27.1	30.6	28.4	26.0	26.5	26.2	592
Aeronautical engineer:							
E	17.6	18.0	18.1	17.9	18.1	18.4	1,465
M	23.3	22.3	23.0	21.9	22.4	25.5	1,465
Premedicine:							
E	20.7	20.5	20.0	20.0	20.1	20.0	6,250
M	24.0	24.5	23.4	23.4	22.9	22.4	6,250
Biology:							
E	20.2	19.6	20.0	18.6	18.7	18.8	2,705
M	22.6	22.7	22.8	20.2	19.6	20.1	2,705
Physics:							
E	22.2	21.5	21.7	22.4	22.6	21.4	662
M	29.1	28.3	29.0	29.5	28.0	28.8	662
National mean:							
E	18.0	17.9	18.1	17.9	17.7	17.5	
M	19.1	18.8	19.1	18.3	17.6	17.5	

Source: Special Processing Creation, ACT, July 26, 1977 and December 12, 1977.

Table 10

ACT English and Mathematics Test Scores
from Freshman Class Profile, 1970-1971

INTENDED AREAS OF STUDY	ENGLISH			MATH		
	$\bar{X}$	SD	N	$\bar{X}$	SD	N
Elementary Education	19.4	4.7	2,950	19.0	6.1	2,950
Secondary Education	20.0	4.7	1,568	20.7	6.5	1,568
National Sample	18.6	5.2	55,702	20.1	6.6	55,702

Source: ACT. College Student Profiles: Norms for the Act Assessment, Vol. II, 1972; ACT Special Processing Creation, Ten Percent Sample Class Profile, January 16, 1978.

Table 11

National Sample, ACT Class Profile Report.
Enrolled Freshmen 1975-1976 (10% Sample).
ACT English and Mathematics Scores.
19 Major Fields of Study.

PLANNED COLLEGE MAJOR	ACT M			ACT E		
	$\bar{X}$	SD	N	$\bar{X}$	SD	N
Education	16.3	7.4	5,229	17.4	5.4	5,229
Agriculture	18.1	7.1	1,809	16.8	5.0	1,899
Architecture	19.5	7.4	801	17.4	5.0	801
Biological sciences	21.3	7.0	1,301	19.4	4.9	1,301
Business and commerce	17.0	7.4	6,235	17.0	5.0	6,235
Communications	17.5	7.1	988	17.8	7.1	988
Computers and information	19.8	8.0	810	17.1	5.4	328
Engineering fields	22.9	7.1	2,490	18.0	5.2	2,490
Fine and applied arts	17.0	7.2	2,336	18.7	5.2	2,336
Foreign languages	19.6	7.2	279	20.6	5.3	279
Health professions	18.6	7.6	7,283	18.4	5.0	7,283
Home economics	16.4	7.3	658	18.0	4.9	658
Letters	18.9	7.0	632	20.0	5.3	632
Mathematics	27.4	5.1	436	20.8	4.9	436
Physical sciences	24.3	6.7	626	20.2	4.7	626
Community services	15.2	7.2	1,406	16.5	5.4	1,406
Social sciences	18.5	7.4	3,195	18.9	5.1	3,195
Trade, industry, technology	16.5	7.3	935	14.9	4.9	935
General studies	17.8	7.4	576	18.6	4.8	576
National sample	17.9	7.7	45,222	17.6	5.3	45,222

Source: American College Testing Program, College Student Profiles: Norms for the ACT Assessment. 1976-77 Edition.

Table 12

National Sample, ACT Class Profile Report.
Enrolled Freshmen 1977-1978 (10% Sample).
ACT English and Mathematics Scores.
19 Major Fields of Study.

PLANNED COLLEGE MAJOR	ACT M			ACT E		
	$\bar{X}$	SD	N	$\bar{X}$	SD	N
Education	15.9	7.3	4,932	17.5	5.3	4,932
Agriculture	17.4	7.2	2,086	16.9	5.0	2,086
Architecture	19.4	7.3	983	17.5	5.0	983
Biological sciences	20.8	7.2	1,308	19.6	4.9	1,308
Business and commerce	16.7	7.5	7,309	17.0	5.0	7,309
Communications	17.9	7.3	1,253	19.2	5.3	1,253
Computers and information	19.1	8.4	969	17.2	5.5	969
Engineering fields	22.8	7.2	2,993	18.1	5.3	2,993
Fine and applied arts	16.5	7.4	2,238	18.6	5.2	2,238
Foreign languages	19.0	6.8	222	20.9	4.8	222
Health professions	18.2	7.6	7,634	18.3	5.0	7,634
Home economics	14.7	7.1	649	16.9	5.2	649
Letters	18.0	7.4	597	19.8	5.3	597
Mathematics	26.8	5.3	393	20.6	4.8	393
Physical sciences	24.1	6.5	745	20.3	5.1	745
Community services	15.0	7.1	1,397	16.6	5.1	1,397
Social sciences	18.6	7.5	3,084	19.3	5.0	3,084
Trade, industry, technology	16.6	7.1	1,056	15.2	4.9	1,056
General studies	18.5	7.4	792	19.0	5.0	792
National sample	17.6	7.8	47,614	17.7	5.3	47,614

Source: American College Testing Program. College Student Profiles: Norms for the ACT Assessment. 1978-79 Edition.

Table 14

National Teacher Examination Test Scores, 1969-1976

YEAR	$\bar{X}$	SD	N
1969	577	96	93,000
1970	581	103	70,000
1971	573	104	101,000
1972	570	105	103,000
1973	576	105	82,000
1974	566	102	78,000
1975	561	109	70,000

Source: Education Testing Service. Personal communication, Norman Wexler.